REMARKS

Claims 1-7 are pending in this application, of which claim 1 is independent. In this Amendment, claim 1 has been amended. Care has been exercised to avoid the introduction of new matter. Adequate descriptive support for the amendment can be found in, for example, Fig. 2 and relevant description of the specification.

The Examiner maintained his position on the rejection of claims 1-7, and made this Office Action final. A Request for Continued Examination is filed together with this Amendment.

Claim 1 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Fermann et al. in view of Agrawal and further in view of Stolen.

In the statement of the rejection, the Examiner admitted that Fermann et al. fail to disclose the numerical value of the nonlinear coefficient of the transmission fiber. However, the Examiner asserted that Stolen teaches that fibers with larger nonlinear coefficients produce higher gains, and Agrawal teaches how to modify fiber parameters so that one skilled in the art could choose/design a fiber with a given nonlinear coefficient. On that basis, the Examiner concluded that it would have been obvious to modify the system of Fermann et al. based on the teachings of Agrawal and Stolen to arrive at the claimed invention.

In response, Applicants have amended independent claim 1 to clarify that the lumped Raman amplifier includes:

> a high-nonlinearity fiber having a negative chromatic dispersion at a wavelength of the signal light and a nonlinear coefficient $(2\pi / \lambda) \cdot (n_2/A_{eff})$ of 6.9 (1/W/km) or more which is defined by a nonlinear refractive index n_2 and an effective area A_{eff} at a wavelength of λ;

an optical coupler provided between said high-nonlinearity fiber and said optical transmission line; and

a pumping light source for supplying pumping light to said high-nonlinearity fiber though said optical coupler.

The claimed optical transmission system requires, among other things, the combination of a signal light source with a positive chirp and a high-nonlinearity fiber with a negative chromatic dispersion. Such a configuration is not taught by the applied combination of Fermann et al., Agrawal, and Stolen.

High-nonlinearity fiber

Applicants first submit that Fermann et al. do not teach the high-nonlinearity fiber, as well as the pumping light source and the optical coupler, as claimed. The claimed lumped Raman amplifier including the high-nonlinearity fiber is provided between the signal light source and the optical fiber, as claimed. According to claim 1 as amended, the high-nonlinearity fiber of the lumped Raman amplifier Raman-amplifies signal light according pumping light supplied from the pumping light through the optical coupler. Accordingly, it is apparent that the high-nonlinearity fiber functions as a Raman amplifying fiber.

In contrast, Raman-shifter 10 of Fermann et al. transmits light from laser 9, and does not receive pumping light. Thus, the Raman-shifter of Fermann et al. is different from the claimed high-nonlinearity fiber because the claimed fiber transmits both signal light and pumping light respectively outputted form different light sources, while Fermann's shifter transmits light from single light source.

Indeed, Fermann et al. clearly teach in its claim 5 that the Raman-shifter comprises non-amplifying fibers or rare-earth-amplifier-ions-doped amplifying fibers. For example, Fig. 16 of Fermann et al. shows a Raman amplifier using a positive dispersion fiber 61. Fermann et al.

describe that a positive dispersion is preferable (see column 16, line 66 to column 17, line 5). On the other hand, claim 1 recites the high-nonlinear fiber having a negative chromatic dispersion.

It is noted that in Fig. 17 of Fermann et al., the Raman shifter is provided for amplifying pumping light, but is not provided for amplifying signal light. Applicants note that seed light source 64 in Fig. 17 is not a signal light source (see signal in 70).

It is also note that the Examiner, referring to column 10, lines 15-20 of Fermman et al., asserted that Fermman et al. teach the claimed lumped Raman amplifier. However, that cited portion simply describes a PCM (pulse compressor module) 4 of Fig. 4. The PCM is irrelevant to the claimed lumped Raman amplifier.

Signal light source

Applicants further submit that Fermann et al. does not teach the claimed signal light source "outputting signal light with a positive chirp," as recited in claim 1 (emphasis added). In the statement of the rejection, the Examiner, referring to column 7, lines 16-23, asserted that laser 9 corresponds to the claimed signal light source. However, column 7, lines 16-23 of Fermann et al. does not teach, and Applicants did not find any teachings in Fermann et al., that laser 9 has a positive chirp.

Examiner's other comments on page 4 of the Office Action regarding Fermann et al.

The Examiner specifically stated as follows:

- Fermann also discloses that it is advantageous to make a modular system so that desirable components may be assembled into an optimized product. [Col. 4, lines 9-22].
- Fermann also discloses that for larger compressions, one needs fibers with larger negative dispersions (more negative/farther from zero) at the signal wavelength. [Col. 1, line 30—Col 3, line 4].

However, column 4, lines 9-22 merely describes an applicable field of the system of Fermann et al., and does not teach the claimed invention. In addition, column 1, line 30 to column 3, line 4

does not teach "larger negative dispersion." The claimed invention may not need to obtain a large pulse compression.

Accordingly, Fermann et al. do not teach an optical transmission system including, at a minimum, the signal light source, and the lumped Raman amplifier including the high-nonlinearity fiber, the optical coupler, and the pumping light source, recited in claim 1.

Stolen teaches a large nonlinear amplification, but does not teach a Raman amplification (Raman gain coefficient). Agrawal teaches equation 2.4.4 with parameters of β_1 (dispersion) and β_2 (dispersion slope), but does not teach the claimed nonlinear coefficient $(2\pi/\lambda) \cdot (n_2/A_{eff})$. Accordingly, Stolen and Agrawal do not cure the deficiencies of Fermann et al.

Based on the foregoing, Applicants submit that Fermann et al., Agrawal, and Stolen, either individually or in combination, do not teach an optical transmission system including all the limitations recited in independent claim 1. Applicants, therefore, respectfully solicit withdrawal of the rejection of independent claim 1 under 35 U.S.C. §103, and favorable consideration thereof.

Claims 3, 4, 6, and 7 were rejected under 35 U.S.C. § 103 for obviousness predicated upon Fermann in view of Agrawal and Stolen; and claim 5 was rejected under 35 U.S.C. § 103 for obviousness predicated upon Fermann in view of Agrawal, Stolen and Akasaka.

Each of the above rejections of claims 3, 4, 6 and 7 and of claim 5 is traversed. Specifically, claims 3 through 7 depend from independent claim 1. Applicants incorporate herein the arguments previously advanced in traversing the imposed rejection of claim 1 under 35 U.S.C. § 103 for obviousness predicated upon Fermann et al. in view of Agrawal and Stolen. The Examiner's additional comments and secondary reference to Akasaka do not cure the

previously argued deficiencies in the attempted combination of predicated upon Fermann, Agrawal and Stolen.

Applicants, therefore, submit that the imposed rejection of claims 3, 4, 6 and 7 under 35 U.S.C. § 103 for obviousness predicated upon Fermann in view of Agrawal and Stolen, and the imposed rejection of claim 5 under 35 U.S.C. § 103 for obviousness predicated upon Fermann in view of Agrawal, Stolen and Akasaka, are not factually or legally viable and, hence, solicit withdrawal thereof.

Claim 2

Applicants note that the Examiner did not specifically reject claim 2[1], which has been amended to depend from claim 1. Accordingly, claim 2 is clearly free of the applied prior art by virtue of its dependence upon claim 1.

Conclusion

It should, therefore, be apparent that the imposed rejections have been overcome and that all pending claims are in condition for immediate allowance. Favorable consideration is, therefore, respectfully solicited.

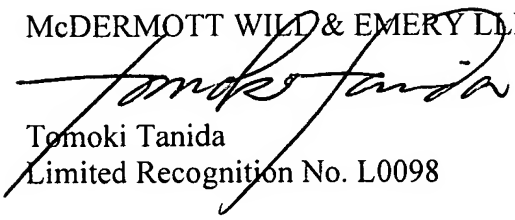
To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper,

[1] In the Office Action Summary, claim 2 was grouped with the rejected claims.

including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



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